R01 - Topics 1&2 – Quantitative Chemistry & Atomic Structure Review:

Name:
Date:
Course: IB Chemistry

1. Convert each of the following into scientific notation.
   a. 91 500 000 _____ b. 0.00000456 _____

2. Arrange these masses from **smallest to largest values**: (5 points)

   155 mg 2.65 µg 1.35 x 10^{-3} kg 14450 ng 125 cg 85 g

   ……..

3. Complete the following table of subatomic composition:

Isotope Name	*Nuclear Symbol*	*Protons*	*Electrons*	*Neutrons*	*Mass Number*
Iron-57	$^{57}_{26}Fe$	……	……..	……	……
Carbon-14 ……..		……	……..	……	……

4. Carbon tetrachloride, CCl_4, has a density of 1.594 g cm^{-3}. What volume of carbon tetrachloride will contain 3.75 x 10^{25} molecules?

5. Determine the percent composition (to the hundredths place) for cobalt (III) hydroxide:

6. Determine the empirical formulas if the compound contains 54.05% calcium, 2.70% hydrogen, and 43.24% oxygen

7. Determine the number of grams of **each** product produced when 35.45 grams of lithium reacts with an excess of water.

8. Your body deals with excess nitrogen by excreting it in the form of urea, NH_2CONH_2. The reaction producing it is the combination of arginine ($C_6H_{14}N_4O_2$) with water to give urea and ornithine ($C_5H_{12}N_2O_2$).

   $$C_6H_{14}N_4O_2 + H_2O \rightarrow NH_2CONH_2 + C_5H_{12}N_2O_2$$

   If you excrete 95 mg of urea, what quantity of arginine must have been used? What quantity of ornithine must have been produced?

9. antimony trichloride + hydrogen sulfide ---> hydrochloric acid + diantimony trisulfide

10. ammonia + oxygen ---(heat)---> nitrogen (II) oxide + water

11. Solutions of nitric acid and potassium hydroxide are mixed, give the true equation, ionic equation, and net ionic equation (be sure to include states of matter in each step).

12. What mass of magnesium will react with an excess of hydrochloric acid to produce 500 mL of hydrogen at STP?

13. What is the volume of 55.5 grams of hydrogen gas at a temperature of 23.5 degrees C and a pressure of 756.5mm Hg?

14. A gas occupying 35.0 mL at 20.0 degrees C and a pressure of 775 mm Hg is cooled until it reaches -45 degrees C while the pressure remains constant. What is the new volume of the gas?

15. Write the complete electron configuration [spectroscopic notation] for each of the following elements without using your periodic table. Do not forget the Aufbau Principle [Order of filling by energy].

S [Z=16]

Ge [Z=32]

Sr [Z =38]

16. Arrange the members of the following groups of elements in order of **increasing** atomic radius.

a. Na, Mg, Al, Si, S

.....

b. Ga, Ge, As, Sb, Br

.....

17. Arrange the members of the following groups of elements in order of **increasing** first ionization energy.

a. N, P, As, Sb, Bi

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b. Li, Be, B, C, N, O, F

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18. Arrange the members of the following groups of elements in order of **increasing** electronegativity.

a. Na, Mg, Al, Si, S, Cl

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b. C, Si, Ge, Sn, Pb

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19. Give a set of quantum numbers for each of the following: (2 points each)

a. The last electron added to the element P .....

b. all the "p" electrons in the element Na .....

20. The <u>particles</u> U,V,W,X and Y all have three shells of electrons and the same number of electrons. They are listed in order of increasing size. The only neutral atom is W. U reacts with Y to form the compound UY and with X to form the compound UX_2. Identify the actual elements using your periodic table.